3t Mukherjea O, Y-4,5 (ca. 1933-1939) 1962
AW42 Santal AW42

what Hunter calls, "the advance guard of the hill system of the central India Plateau." Midnapur resembles Bankura more or less in topography; but it is not so hilly. It has its laterite soil, mòhua and sal trees,—a characteristic back-ground inseparable from the Santals.

Distributed throughout this wide area live the Santal, a man of medium size but muscular and strong, with a complexion varying from light-brown to an ebony colour, almost beardless and his ox-eyed, merry women-folk. The physical features that distinguish them from the rest of the population are that they have a round outline and look rather stout. They have, what is called by Col. Dalton, "a blubbery style of face," noses broad with a depressed bridge, and hair black, straight, coarse and curly. The mouth is a large one and the lips thick and projecting; "the zygomatic arches prominent, while the proportions of the skull, approaching the dolichocephalic type, conclusively refute the hypothesis of their Mongolian descent."[1]

Although the theory of Mongolian descent of the Santal is no longer tenable, it is worth noting that faces of a Mongoloid type are sometimes seen amongst them. Rev. Bodding has seen "spots in the pigment of the skin of Santal children, which,

1 Ref. Risley, *People of India*, App. VIII, p. clvii.

Jt Mukherjea O. Y-4, 5 (ca. 1933-1939) 1902
AW42 Santal AW42

has been going on for hundred years ever since civilisation dawned on the banks of the lower Ganges, and is yet far from complete, has led to a distinct uplift of the primitive peoples, and has been making highly desirable additions to the culture of the civilised community."

The Santal Character

Any one who comes in contact with the Santal, cannot but be struck with the heavy-built, bronze-bodied men and women. They are extremely hardy and can work incessantly with a smiling face. If the body is thus healthy, the mind is equally so. The truthfulness of the Santal is proverbial; the exceptions are due to his contact with the outside world. Accused in criminal courts the Santal would cut short everything by a clean confession. He is generally a meek fellow; but if he says "no" once, none can turn it into "yes."

Any one who has seen a Santal house, cannot but be struck with their habitual cleanliness. All things are kept neatly arranged. No dust can accumulate in the yards and all refuse and rubbish are neatly stowed away. The Santal is frank and open, honest and gentle. He does not understand the intricacies of life and craft and hypocrisy are not associated with him.

3: Mukherjea O. Y-4, 5 (ca. 1933-1939) 1962
AW42 Santal AW42

142
291
301
302
411
516

[End Plate 1]

A Santal Couple

[Page 49]

Photo: Mayurbhanj State

3: Mukherjea O. Y-4, 5 (ca. 1933-1939) 1962
AW42 Santal AW42

142
291
302

Santal Physical Types [Page 49]
Photo : Mayurbhanj State

142
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301
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516

[End Plate 2]

Santal Girls of Modern Times
[Page 49]
Photo : Indra K. Chatterjee

3: Mukherjea O. Y-4,5 (ca. 1933-1939) 1962
AW42 Santal AW42

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302
516
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[End Plate 3]

Washing Clothes [Page 64]

Photo. Tilak Bandopadhyay

3: Mukherjea O. Y-4, 5 (ca. 1933-1939) 1962
AW42 Santal AW42

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At a Fair

[Page 64]

Photo : D. S. Nahar

[End Plate 4]

3: Mukherjea O, Y-4, 5 (ca. 1933-1939) 1962
AW42 Santal AW42

142
231
291
301
302
516
243
285

Winnowing Corn

[Page 98]

Photo : Tilak Bandopadhyay

[End Plate 7]

3: Mukherjea O, Y-4,5 (ca. 1933-1939) 1962
AW42 Santal AW42

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291
301
302
832

The type that charms [Page 410]
Photo : Tilak Bandopadhyay

[End Plate II]

3: Mukherjea O. Y-4, 5 (ca. 1933-1939) 1962
AW42 Santal AW42

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832

A Santal belle [Page : 410]

Photo : Tilak Bandopadhyay

[End Plate 12]

4; Biswas D, E-3, 4 (1931-1945) 1956
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141 Thus we see that 46% of the Santal males investigated, possess the somatic characters, short-medium stature; Dolicocephaly; and Mesorrhine; characters which Haddon would term a blend between the Dravidian and Pre-Dravidian strains. Fourteen percent of the sample is Short-Medium statured, Dolicocephalic, and Platyrrhine, characteristics of the Pre-Dravidian according Haddon and his followers. The typically Dravidian type, of Short-Medium stature, Dolicocephalic, and leptorrhine, number 8%. There is an intermixture of the Pre-Dravidian and Dravidian elements, on the one hand, and an Alpine or Pamirian element on the other, among 14%, who show Short-Medium stature, show Mesocephaly and are Mesorrhine.

142 **Santals (A Study in Somatoscopic Characters).**

Skin Colour:—The unexposed skin varies in colour from light brown (17) to dark brown (26)*. Ninety-eight percent of the Santals are dark-brown, and a negligible 2% are light brown.

Hair Form:—Low waves occur in 84% of the Santals surveyed, and 8% have straight hair. The remaining 8% can be accounted for, by curly, deep waves, and medium wave forms in the proportion of 5 : 2 : 1. Wooly hair is conspicuous by its absence.

Hair Texture:—Hair of medium texture occurs in 81% of the people, and there are 16% of the sample with coarse hair. Fine textured hair is rare and occurs among only 3%.

*The numbers in parenthesis indicate the colours on the skin chart devised by Von Luschan.

4: Biswas D, E-3, 4 (1931-1945) 1956
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Hair Quantity :—Thick growth in 21.0%; medium in 65%; and normal in 14.0% the hair quantity displays no eccentricities. This characteristic was only visually observed. No attempt was made to count the number of follicles in a given area of skin, as this would have entailed too much time. 142 ●

Hair Colour :—The hair displays black pigment in 94% cases, and 5% of the cases have dark brown hair. 1% have light brown hair. No other hair colours are found.

Eyecolour :—Eightynine percent of the Santals have dark brown eyes, corresponding to No. 3 of Martin's Eye Colour Chart. Light brown and black eyes; i.e. Nos. 4 and 2 of Martin's Eye Chart are present in the remaining population in 6% and 5% respectively. No other colour were noted.

Iris :—Leaving the 1% with a speckled iris, the other 90% possess eyes in which the iris is homogenous.

Eyeslits :—All the eyeslits examined were straight. There is no trace of oblique eyeslits.

Epicanthic fold :—This easily recognizable characteristic of the Mongoloid people was completely absent.

Eyebrows :—Seventy-six percent of the sample shows medium eyebrows. There are 19% thin eyebrows, and only 5% have thick and connected eyebrows.

Supra-orbital ridges :—Trace of the supra-orbital ridges can be seen in 60%. Thirty-seven percent have imperceptible ridges, 2% have moderate and 1% continuous eyebrow ridges. Pronounced development of the eyebrow ridges is absent.

4: Biswas D, E-3, 4 (1931-1945) 1956
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#142 **Nasion Depression** :—The nasion depression is medium in 65%. In 20% the depression is shallow, and in the remaining 15% the depression is deep.

Nasal Bridge :—Santals display a monotonous straight bridge. No other varieties could be seen.

Nasal Septum :—Horizontal in 93%, upwards in 4% and downwards in 3%.

Forehead :—Sixty-seven percent of the sample display a straight and broad forehead. Sloping and medium foreheads are observed in 24%. A high forehead with a medium slope occurs in 8%, and 1% possess forehead with a marked slope.

Lips :—Medium lips are by far the most common (60%), with thick lips coming next, (32%), and thin lips last, (8%) in this sample.

Eversion :—Seventy percent have a slight eversion and 23% display eversion of medium intensity. Four percent reveal marked eversion, and only 3% do not have everted lips.

Chin :—Medium and oval chins occur in 80%, prominent and oval chins in 19%, and a square chin in 1%. The receding and pointed chins are not observed.

Prognathism :—Though prognathic jaws are only slightly so, the majority of the population exhibits this trait. Fifty-eight percent exhibit alveolar prognathism and slight facial prognathism is observed in 35%. Seven percent do not show prognathism. No marked prognathic face was seen.

Ear lobe :—Fifty-six percent have an attached earlobe, and it was absent in only 4%.

4: Biswas D, E-3, 4 (1931-1945) 1956
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Incisor fold :—Only 1% showed a slight incisor fold. 142

Body :—Seventy four per cent had bodies of medium musculature, and 14% were weakly built. The remaining 12%, were markedly well built.

Santal (Correlation).

Table showing co-efficients of co-relation with Probable Errors 141

1. Head Length and Head Breadth :—0.0016±0.067
2. Nasal height and Nasal Breadth :—0.29±0.061
3. Total facial height and Bizygomatic Breadth :—0.61±0.042
4. Upper facial height and Bizygomatic breadth :—0.26±0.062
5. Head length and Head height : —0.18±0.064
6. Head breadth and Head height :—0.28±0.061
7. External Orbital breadth and Orbito-nasal curves :—0.75±0.029
8. Height vertex and Maximum Hip Breadth :—0.24±0.063

1. *Head Length and head breadth* :—There has been found to be, after tabulation and calculation, very little (insignificant) positive correlation between the variables 'Head Length' and 'Head Breadth' in the case of this sample. No doubt, on an average, the increase in the Head Length of a Santal individual is accompained by a corresponding increase in his Head Breadth yet the co-efficient of correlation (0.0016) is of no standing.

2. *Nasal Height and Nasal Breadth* :—These measurements are of great significance from the somatometric point of view, for they enable us to evaluate

4: Biswas D, E-3, 4 (1931-1945) 1956
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141 Therefore Expected Frequency $(A_n B_n)_0$ can be found out by the application of the relation $(A_n B_n)_0 = \frac{(A_n)(B_n)}{N}$. Hence $(A_n B_n) = \frac{12 \times 6}{100} = 0.72$.

C, the coefficient of Mean square contingency $= \sqrt{\frac{S-N}{S}}$ where S=sum of the squares of the actual frequencies of the pairs of attributes, + Independence frequencies. From our data $S = \frac{(12)^2+(6)^2}{0.72} = \frac{180}{0.72} = 250$

$\therefore C = \sqrt{\frac{250-100}{250}} = \sqrt{\frac{15}{25}} = \frac{3.8}{5} = 0.76$

Thus we find that the coefficient of Mean Square contingency which determines the association between the Hair Colour and Eye Colour of our Santal subjects is 0.76 (below unity). In other words the pairs of attributes under consideration (Hair Colour and Eye colour) in actual combinations depart from chance expectation to a considerable extent.

128 **2. Association between the skin colour and eye colour of Santals:**

141 We have already noted under physical observations
142 that a clear majority of Santals show a dark brown colour on the skin as well as in their eyes. The former class is represented by 98.0 percent individuals, and 89.0 percent individuals can be included in the latter classification.

It is further brought out that there are only ten individuals in a total of hundred whom we have studied, who have dark brown skins alright but without dark
128 eyes. On the other hand not a single individual exists
141 having eyes of a dark-brown colour, without the skin tinted with the corresponding colour. So that in the

4: Biswas D, E-3, 4 (1931-1945) 1956
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mathematical relation that enables us to arrive at the expected or independent frequency $(A_m B_s)_0$. Am = 10 and B_s = 0.

FORMULA—Independent Frequency = $\frac{(A_m)(B_s)}{N}$, where N in the denominator represents the number of individuals examined for the pair of attributes under investigation.

Hence we get on the actual application of the values, the value of $(A_m B_s)_0$ or Independent Frequency = $\frac{(10 \text{ (Zero)})}{100}$ = 0 Actual counting reveals that both the attributes (A_m and B_s) are present in no less than ninety (90) individuals, i.e. $(A_m B_s)$ = 90.

Now, in order to find out the coefficient of mean of the actual frequencies of the pairs of attributes square contingency, we must know S; S stands for the sum of the squares divided by Independence Frequencies. S, according to our data $\frac{(10)^2+(0)^2}{0} = \frac{100}{\text{Zero}}$ = (Infinite) Therefore C or the coefficient of Mean Square contingency = $\sqrt{\frac{S-N}{S}}$ = $\sqrt{\frac{\infty-100}{\infty}}$ = ZERO

The zero value of the coefficient implies that there is no deviation from the Independent Frequency, a condition which is a rare occurrence in limited samples.

3. Association between colour of skin and hair colour of Santals.

While studying the physical features of Santals, we noted that a majority of them (94.0 p.c. have black hair and that in a greater majority still (98.0 p.c.) they possess skins of dark-brown colour.

1 2 [Errata: these should read "independence."
Cf. errata sheet, category 116, p. ix - Analyst]

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Dermatoglyphics of the Santals.

142 [128] **Palmar Prints:** In the following pages I have embodied the result of my study on 50 hand prints of 25 Santals. All belong to male sex.

Main-line formulae :. It has been observed that the frequency of the three typical formulae 11.9.7.-, 9.7.5.-, and 7.5.5.- varies in different races.

The following types of formulae are obtained, in the right and left palms of the Santals.

TABLE I.

No.	*Right hand Types of formula*	*No.*	*Left hand Types of formula*
1	11.9.7.5.	1	11.9.7.5.
2	11.7.7.5.	2	11.7.7.3.
3	11.7.7.3.	3	9.9.5.5.
4	9.9.7.5.	4	9.7.5.5.
5	9.9.5.5.	5	9.0.5.5.
6	9.9.5.3.	6	7.9.5.5.
7	9.7.5.5.	7	7.7.5.5.
8	9.0.5.5.	8	7.5.5.5.
9	7.5.5.5.	9	7.5.5.4.
10	7.5.5.3.	10	7.5.5.3.
		11	7.5.5.1.

It can be seen from Table I that the different types of formula appear more in the left hand than in the right hand. In the left hand I have got eleven and in the right ten.

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The following fourteen different types of formulae are obtained. 142 •

TABLE II.

Formula	Right Hand	Left Hand	Sum	Percentage
7.5.5.1.	0	1	1	2
7.5.5.3.	2	1	3	6
7.5.5.4.	0	1	1	2
7.5.5.5.	1	2	3	6
7.7.5.5.	0	2	2	4
7.9.5.5.	0	1	1	2
9.0.5.5.	2	1	3	6
9.9.5.3.	1	0	1	2
9.7.5.5.	4	8	12	24
9.9.7.5.	1	0	1	2
9.9.5.5.	1	1	2	4
11.7.7.3.	0	1	1	2
11.7.7.5.	1	0	1	2
11.9.7.5.	12	6	18	36
Total	25	25	50	100

In the table III the frequency of the three typical formulae in percentages is given.

TABLE III.

Formula	Right Hand	Left Hand	Sum
11.9.7.-	24.0	12.0	36.0
9.7.5.-	8.0	16.0	24.0
7.5.5.-	6.0	10.0	16.0

The formula 11.9.7.- appears in larger numbers in the right hand whereas the formulae 9.7.5.- and 7.5.5.- occur in larger proportion in the left hand.

The following table shows the frequency of the three main-line formulae among the Santals and other races.

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TABLE IV.

Main-line Formula in Percentage.

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People.	*11.9.7.-*	*9.7.5.-*	*7.5.3.-*	*Authors.*
Japanese.	16.0	19.0	24.3	Wilder
Japanese.	17.7	16.9	33.0	Hasebe
Chinese.	9.0	23.5	27.5	Wilder
Chinese.	18.1	19.3	32.0	Shino
Koreans.	18.1	17.1	32.0	Miyake
Eskimos.	30.3	41.4	6.6	Abel
Europeans.	31.0	26.2	10.1	Cummins
Rajis.	33.0	30.0	7.0	Tiwari.
Bhotias.	18.0	20.0	22.0	Tiwari.
Ainu.	18.2	18.2	19.1	Hasebe
Indians.	44.2	11.5	15.4	Schlaginhaufen
Indians.	46.0	15.0	18.0	Biswas
Oriyas.	29.0	18.0	19.0	Biswas & Chaudhury
Bengalis.	33.0	34.0	19.0	Biswas.
Santals.	36.0	24.0	16.0	Biswas.

By studying the above table it can be seen that in Santal palms the formula 11.9.7.- occurs in larger number like the European-Americans, Bengalis, Oriyas, Indians (in general). But the formula 7.5.5- occurs in larger number among the Japanese, Chinese and Koreans. In the Ainu hand both the formula appear almost in equal number.

According to Wilder 7.5.5. (1-5) is the Negro formula and 11.9.7 (1-5) is the white. In the Santals the Negro formula is found in 16% and the white in 36%.

TABLE V.

Races	*Negro formula 7.5.5(1-5)*	*White formula 11.9.7(1-5)*	*Authors*
Japanese	33.0	17.7	Hasebe
Koreans	32.0	18.1	Miyake
Chinese	32.0	18.1	Shino

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Races	*Negro formula 7.8.5(1.4)*	*White formula 11.9.7(1.4)*	*Authors*
Ainus	10.1	18.2	Hasebe
Indians (in general)	15.4	44.2	Schlaginhaufen
Indians (in general)	18.0	46.0	Biswas
Rajis	7.0	33.0	Tiwari
Bhotias	22.0	18.0	Tiwari
Oriyas	19.0	29.0	Biswas & Choudhury
Bengalis	19.0	33.0	Biswas
Santals	16.0	36.0	Biswas

Among the Mongolians the Negro formula occurs in larger numbers whereas among the Santals, Oriyas, Bengalis and Indians in general, the white formula appears in greater number. In the Ainus they appear almost in equal numbers.

TABLE VI.

Main Lines

In the table below the frequencies of the different endings of the four main lines D. C. B. A. are given.

	Right hand				*Left hand*			
Endings	D	C	B	A	D	C	B	A
0		2				1		
1								1
2								
3				3				2
4								1
5		3	11	22		5	18	21
6								
7	3	6	14		8	11	7	
8								
9	9	14			10	8		
10								
11	13				7			
12								

The line D ends in the three following areas 11,9 7. This line ends 20 times on the area 11 and 19 times on the area 9 and 11 times on the area 7, which signifies that the main line D runs always to the radial side. The line D ends frequently on the areas 11 and 9. The

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142 same is the case with the population of Europeans in America. But among the Mongolians the line D ends more often in the area 7 and for the Ainus in 9.

The line C ends on the areas 0,5,7 and 9 end on the area 9 and 7 in larger numbers. Among the Santals the line C runs both to the radial and ulnar sides, but more to the radial side. The same is the case among the Oriyas, Bengalis and European-Americans. But among the Mongolians it is quite the reverse.

The line B always runs to the ulnar side. It ends on the areas 5 and 7, of which area 7 claims larger numbers. The line A ends on the areas 1,3,4,5; but mostly on the area 5. That shows the main line A runs always towards the ulnar side.

Thus the line D, in the case of Santals like the Indians (in general) Oriyas, Bengalis and Europeans ends more frequently on the area 11 whereas in the case of Mongolians it ends on the area 7. The line C,B,A of the Santals ends on the areas 9.7.5. respectively and the same is the case in the Oriyas, Bengalis, Europeans-Americans, whereas in the case of Mongolians they all end mostly on the area 5. In the Chinese hand the line A ends often on the area 3.

Asymmetry of the four Main lines (D.C.B.A) on the Right & Left Hand.

The endings of the four Main lines show a marked difference between the right and left hand. The line D on the right hand ends on the area 11 in larger numbers (52%) whereas on the left hand it ends more frequently (40%) on the area 9. On the area 7 the line D runs on the right hand in 12% and on the left hand in 32%.

1 [Erratum: this should read "and." Cf. errata sheet, category 116, p. ix -- Analyst]

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The line C ends on the area 9 in larger numbers, in the right hand in 56% and in the left hand in 32%. On the area 7 this line ends in 24% in the right hand, and in the left hand it ends in 44%. On the area 5, the line C ends in 12% in the right and 20% in the left hand. 142

The line B ends on the areas 5 and 7 in both the hands. On the area 5 it ends in 44% in the right hand and in 72% in the left hand. On the area 7 it ends in the right hand in 56% and in the left hand in 28%.

The line A ends in the right hand on the areas 3 and 5 in 12% and 88% respectively whereas in the left hand it ends on the areas 1, 3, 4 and 5 in 4%, 8%, 4% and in 84% respectively.

Pattern on the Hypothenar areas

On the Hypothenar area of the human palm various types of patterns appear. The frequency of the appearance of patterns on this area of the Santal hands is given in the table below.

TABLE VII

Patterns	*Right Hand*	*Left Hand*	*Total*	%
L^r	3	2	5	10
L^u	3	5	8	16
L^u/L^u	1	...	1	2
A^u	2	...	2	4
A^r	2	...	2	4
A^r	...	1	1	2
O	14	17	31	62
Total.	25	25	50	100

From the table above it appears that Pattern 'loops' occur in larger numbers. Loops opening towards the ulnar side occur in 16%, and loops opening towards the radial side in 10%.

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Comparative Table on the appearance of Loop in the hands of different races.

TABLE VIII.

Race	*%*	*Hands*	*Authors*
Japanese	29.3	552	Hasebe
Chinese	16.9	616	Shino
Koreans	23.5	268	Miyake
Eskimos	40.7	135	Abel
Ainus	36.4	110	Hasebe
Red Indians	5.4	37	Cummins
American Europeans	37.17	600	Cummins
American Europeans	41.0	200	Wilder
Rajis	16.0	100	Tiwari
Bhotias	15.0	100	Tiwari
Bengalis	20.0	100	Biswas
Oriyas	35.0	100	Biswas & Choudhury
*Indians (General)	32.0	100	Biswas
*Indians (General)	42.5	52	Schlaginhaufen
Santals	28.0	50	Biswas

From the above table it appears that among Chinese, Koreans, Eskimos, Red Indians and Bengali hands, the pattern 'loop' occurs in the hypothenar in lesser number than the other races.

Pattern on the Thenar Area.

TABLE IX

Pattern	*Right Hand*	*Left Hand*	*Total*	*%*
Loop	1	2	3	6

Loops on the thenar area appear in the lesser number in the Santal hands. In table below I am citing how loops appear in other races.

*Excluding the primitive people of India.

4; Biswas D, E-3,4 (1931-1945) 1956
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TABLE X

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Race	%	Hands	Authors
Japanese	5.3	552	Hasebe
Chinese	11.4	616	Shino
Koreans	16.5	368	Miyake
Red Indians	48.0	37	Cummins
Eskimos	4.4	135	Abel
Rajis	4.0	100	Tiwari
Bhotias	8.0	100	Tiwari
Bengalis	14.0	100	Biswas
Oriyas	7.0	100	Biswas & Choudhury
Indians	13.0	100	Biswas
Indians	15.3	52	Schlaginhaufen
Ainus	5.5	110	Hasebe
American Europeans	5.5	600	Cummins
Santals	6.0	50	Biswas

The frequency of patterns on the hypothenar and thenar areas in percentages of the total number of the hands investigated and frequency proportions between one another in different areas are given in the following table.

TABLE XI

Race	Thenar	Proportions	Hypothenar
Japanese	5.3	1:5.5	29.3
Chinese	11.4	1:1.4	16.9
Koreans	16.5	1:1.4	23.5
Eskimos	4.4	1:4.7	20.7
Red Indians	48.0	1:0.1	5.4
Bengalis	14.0	1:1.4	20.0
American Europeans	5.5	1:6.7	37.1
Indians	15.3	1:1.7	43.5
Indians	13.0	1:1.5	32.0
Oriyas	7.0	1:5.0	35.0
Ainus	5.5	1:6.6	36.4
Santals	6.0	1:4.7	28.0

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Pattern on the Interdigital Areas

142 On the human palm there are four interdigital areas I, II, III and IV. For my work I have considered the Interdigital area I not separately but jointly with the thenar. On the other three interdigital areas some patterns generally the loop, nebentriradius and whorl occur. In my data on the Santal hand I have got some patterns which are given in the table below.

TABLE XII.

Patterns	*Area II*				*Area III*				*Area IV.*			
	Rt.	Lt.	Sum	%	Rt.	Lt.	Sum	%	Rt.	Lt.	Sum	%
Loop	1	0	1	2	7	2	9	18	8	9	17	34
Nebentriradius with loop									4	1	5	10
No pattern	24	25	49	98	18	23	41	82	13	15	28	56
Total	25	25	50	100	25	25	50	100	25	25	50	100

In the Santal hand loops on the areas III and IV occur in considerable numbers (18% on III and 34% on IV). Nebentriradius with loops occur on the IV interdigital area in 10%.

Occurence of Pattern Loop on the 3rd and 4th Interdigital Areas of Different races is given below.

TABLE XIII.

Races	*Area III*	*Proportion*	*Area IV*	*Author.*
Japanese	16.5	1:3.3	54.6	Hasebe
Chinese	22.7	1:2.4	55.1	Shino
Koreans	14.9	1:3.7	55.2	Miyake
Eskimos	48.05	1:1.2	60.8	Abel

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Races	*Area III*	*Proportion*	*Area IV*	*Author*
Red-Indians	15.7	1:4.9	76.6	Cummins
Bhotias	30.0	1:2.5	75.0	Tiwari
Bengalis	24.0	1:0.9	22.0	Biswas
Oriyas	33.0	1:1.9	36.0	Biswas & Choudhury
Indians	61.5	1:0.5	34.6	Schlaginhaufen
Indians	49.0 } 53.3	1:0.6	30.0 } 32.3	Biswas
European	40.8	1:1.2	49.0	Cummins
European	37.0 } 38.9	1:0.6	22.0 } 35.5	Wilder
Santal	18.0	1:1.9	34.0	Biswas

The combination Formula of the three Interdigital areas of 50 Santal hands.

TABLE XIV.

	II	*III*	*IV*	*Right*	*Left*	*Sum*	*%*
1	0	S*	0	4	1	5	10
2	0	0	S	8	8	16	32
3	0	0	0	7	14	21	42
4	0	S	T	2	0	2	4
5	0	0	T	3	1	4	8
6	S	S	0	1	0	1	2
7	0	S	S	0	1	1	2

The combination Formulae of the three Interdigital areas of different races are given in the following table.

TABLE XV.

Races	*O.O.S.*	*O.O.O*	*O.S.O*	*Author*
Japanese	53.1	22.1	13.6	Hasebe
Chinese	54.1	13.9	15.1	Shino
Koreans	51.1	20.9	10.5	Miyake
Ainus	40.9	19.1	21.4	Hasebe
Rajis	21.0	15.0	15.0	Tiwari
Bhotias	29.15	10.45	13.35	Tiwari
Indians	29.0	9.0	27.0	Biswas
Oriyas	21.0	39.0	17.0	Biswas & Choudhury
Bengalis	26.3	45.0	11.0	Biswas
Santals	32.0	42.0	10.0	Biswas

*"S" Signifies loop pattern.

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• 142 By combining the three Interdigital areas I have obtained seven different formulae. From the table it can be seen the three formulae O-S-O, O-O-S and O-O-O appear in higher frequency in the Santal hand.

From the table it can be seen that among the Mongolians, Ainus, Bengalis and Santals the formula O-O-S appears more than that of the O-S-O. Whereas in the hands of the Oriyas and Indians in general, the difference in the appearance of the above two formulae is very little.

Axial Triradius

TABLE XVI.

Axial Triradius	*Right Hand*	*Left Hand*	*Total*
t	18	18	36
t'		1	1
tt'	2	2	4
tt"	1	2	3
ttt"	1		1
tt't"	1		1
pt	1	1	2
pt"	1		1
pt't"		1	1
Total	25	25	50

From the above table it appears that, t(carpal triradius) occurs in greater number than the others.

"S" Signifies Loop pattern

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Finger Prints : The data collected on the Santals included impressions of all the fingers of 21 male individuals. The analysis of the data is given below :

The following table shows the frequencies of the three patterns, in percentages, for both the hands

Frequencies of finger-print patterns

TABLE I

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Digit	Hands	*Pattern types* LOOP Whorls	Ulnar	Radial	Total	Arch
I	R	71.42	23.80	4.76	28.56	...
	L	57.14	42.85	...	42.85	...
	R+L	64.28	33.33	2.38	35.71	...
II	R	42.85	42.85	9.52	52.37	4.76
	L	42.85	38.09	19.04	57.13	...
	R+L	42.85	40.47	14.28	54.75	2.38
III	R	38.09	61.90	—	61.90	...
	L	47.01	52.38	...	52.38	...
	R+L	42.85	57.14	...	57.14	—
IV	R	71.42	28.57	...	28.57	...
	L	71.42	28.57	...	28.57	...
	R+L	71.42	28.57	...	28.57	...
V	R	33.33	66.66	...	66.66	...
	L	28.57	71.42	...	71.42	...
	R+L	30.95	69.04	...	69.04	...
ALL DIGITS	R	51.42	44.76	2.86	47.62	0.95
	L	49.52	46.66	3.81	50.47	...
	R+L	50.47	45.71	3.34	49.05	0.47

The first fact that comes to notice when one observes this table is the paucity of arches. Only the second digit displays arches, and that even, only on the right hand. Whorls occur in comparatively high frequency on the I and IV digits, and the striking factor about loops is that no radial loops are observed on the III, IV and V digits of both hands.

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141 Summing up the frequencies for all patterns on all the digits, whorls (50.47%) and Ulnar patterns (45.71%) and most frequent, radial loops (3.34%) less frequent, and arches negligible (0.47%).

TABLE II

142 **Percentages of Whorls, Loops and Arches in different races**

Race	Whorls	Loops	Arches	Author
Bushmen	15.1	68.5	16.4	Weninger '36
Hottentot	18.6	76.3	5.1	Fleischbacker '34
Norwegians	25.6	66.9	7.4	Bonnevie
English	26.0	67.3	6.5	Galton
Germans	30.3	62.7	7.0	Lublien '40
Spaniards	30.3	63.2	6.5	Oloriz '08
Italians	36.4	58.4	4.7	Falco
Ainus	34.6	62.2	3.3	Koya '37
Rajputs(Jaunsar)	39.2	53.6	7.1	Monga*
Oraons	36.6	57.3	6.1	Verma
Koltas (Jaunsar)	41.0	53.6	5.4	Deol*
Rajputs (Kulu)	48.3	50.6	1.0	Datta*
Rajis	46.3	52.5	1.0	Tiwari
Bhotias	50.7	46.9	2.2	Tiwari
Santals	50.47	49.05	0.47	Biswas
Javanese	34.6	64.1	1.3	Abel '40
Formosans	36.4	58.9	4.8	Kubo '28
Red Indians	42.0	55.5	2.3	Cummins '30
Eskimos	72.2	26.0	0.8	Abel
Sumatrans	45.1	53.1	1.7	Kleiweg de Zwaan
Japanese	45.1	52.7	1.8	Kubo
Koreans	48.1	49.8	2.1	Tanaka
Chinese	50.6	47.6	1.4	Kubo '18
Australians	77.6	22.1	0.2	Cummins and Setzler

From the above table, a clear difference is evident in the frequency of the appearance of three basic

*Unpublished data

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pattern types in the different races. The European Whites are characterized by a lesser percentage of whorls and more of loops and arches. The Negores exhibit even a lesser frequency of whorls and consequently possess more loops and arches than the Europeans. The Mongoloids in East Asia are on the other extreme against the Europeans in the percentage of whorls, loops and arches. They show a much greater frequency of whorls and very few arches; the frequency reaching highest among the Eskimos who are reported to possess 72.2% of whorls and only 0.8% arches, the rest being loops. The finger prints of the Australian aborigines (Cummins and Setzler) have revealed the greatest whorl percentage i.e., 77.6% reported so far. 142 •

The Ainus of Japan and Formosans are, however, an exception to this generalization, as they exhibit a very close resemblance to the European Caucasoids in the pattern type frequency.

The people of India belonging to so very diverse and heterogenous ethnic types, show great variations in the percentage of whorls, loops and arches; which sometimes place them with the whites and sometimes with the Mongoloids. The Oraons, Rajputs (Jaunsar) and Punjabis come nearer to whites of Europe, whereas the Bhotias, Rajis and Rajputs of Kulu exhibit Mongoloid affinities.

In this respect the Santals are strikingly similar to the Bhotias and Rajis of the Sub-Himalayan region and also show a close proximity to the Chinese in the occurrence of the whorls, loops and arches.

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TABLE III

Frequencies of Pattern types in %

	Index of Pattern Intensity	Dankmeijer's Index	Furuhata's Index	Material	Investigator
Bushmen	9.87	108.6	21.8	32	Weninger '36
Pygmies	10.16	90.1	23.4	886	Abel '40
Hottentot	11.35	27.4	24.3	50	Fleischhacker '34
Negroes (Congo)	11.62	28.3	31.8	357	Abel '40
Norwegians	11.83	28.89	38.2	24518	Bonnevie
Dutch	11.84	29.38	39.6	2222	Dankmeijer '34
English	11.93	25.0	38.6	500	Galton
Danes	12.13	28 12	45.9	101511	Bugge '32
Portuguese	12.29	15.69	40.1	5000	de Pina '36
Spaniards	12.37	21.45	47.9	10000	Oloriz '08
German	12.33	23.10	48.32	408	Laffeu '40
Hungarian	12.73	15.47	51.5	833	Bonnevie '29
Ainus	12.88	9.12	48.77	55	Hasebe '18
Italian	13.14	12.94	62.3	2129	Falco '08
Sikhs (Punjab)	12.59	22.22	56.1	100	Singh
Oraons	13.05	16.6	63.8	177	Verma

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Rajputs (Jaunsar)	13.20	18.11	73.11	80	Singh
Koltas (Jaunsar)	13.56	13.17	76.4	80	Deol
Gujars	13.80	6.58	73.2	30	Massey
Indians	14.03	5.29	76.9	50	Biswas
Rajis	14.51	2.1	88.1	60	Tiwari
Rajputs (Kulu)	14.72	2.19	93.4	48	Datta
Bhotias	14.83	4.3	108.1	36	Tiwari
Santals	14.99	0.93	102.89	...	Biswas
Javense	13.31	7.52	58.56	1000	Dankmeijer '38
Formoeans	13.17	13.18	61.8	52	Kubo '28
Red Indians	13.95	5.47	75.4	35	Cummies '30
Eskimos	13.91	8.23	78.55	145	Cummins and Falericius Hansen
Swatrans	14.33	3.76	84.9	500	de Zwaan '08
Japanese	14.29	3.99	85.57	700	Kubo
Koreans	14.60	4.36	96.58	2677	Tanaka
Chinese	14.88	2.76	106.30	300	Kubo '18
Australian Aborigines.	17.73	0.25	305.22	84	Cummins and Setzler '51

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•142 The above table displays the Pattern Intensity Index (Cummins & Steggerda '35), the Arch/whorl Index of Dankmeijer '34 and the Whorl/Loop Index of Furuhata '27.

Since the frequencies of the three pattern types vary greatly in different races, the index of pattern intensity, which gives a measure of the complexity of the patterns as a whole, could be utilized for comparison with other races to asses the racial position of a particular ethnic group. The whorls, loops and arches are assigned the values 2,1 and 0 respectively, (depending upon the number of deltas of the pattern type).

In the populations worked upon so far this index varies from about 10 among the Bushmen to the value as high as 17.73 among the Australian aborigines thus exhibiting an abundance of whorls and in frequency of arches. The mean index of pattern intensity ranges from 9.87 to 11.62 among the Negroes ; the Europeans varying from 11.83 or roughly 12 to 13.14 as among Italians and the Mongoloids ranking at the top with the index as high as 15.17.

The Santals lie very close to the Bhotias, Rajputs (Kulu) and Rajis of Almora, the people of Mongoloid affinities.

The Dankmeijer's Arch-Whorl Index tabulated above also shows a clear demarcation in the different peoples of the world. Dankmeijer ascribes the low index to the Mongoloids (below 10) and more than 10 to the Caucasoids. This index calculated above shows the highest value among the Negroes, reaching highest (108.6) among the Bushmen.

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Among the Indians the value of this index varies between 2.1 (Rajis) and 16.6 among the Oraons. The Santals with an index of 0.93 fall in the Mongolian group. 142 •

Regarding the Whorl/Loop index (Furuhata), the Negroes have the least value ranging from 21.8 among Bushmen to 31.8 among Negroes of Congo. The Europeans have a higher value than the Negroes, which increases from Northern to Southern side, with the increase of whorls and decrease of loops—the indices range from 38.2 to 62.3.

The Mongoloids, however, possess the highest index, the Chinese having the main index of 110.9. The Eskimos with a value of 268.4 rank the highest in the indices of the races so far reported.

The Santals fall in the range of the Mongoloids and come very near to the Bhotias, Rajputs (Kulu) and Rajis, of India who have some Mongoloid characters.

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Parganait
MR. SAKRAM HEMBROM
and his family (*Christian*)

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Assistant to the Parganait
DESH-MANJHI
(*Christian*)

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CHAPTER I

THE MAKING OF A PEOPLE

The Santals are one of the largest of the tribal peoples of India; at the census of 1931 they numbered over two and a half million. Their villages are widely distributed over the area which lies between eighty-six and eighty-eight meridians east longitude and between twenty-two and twenty-six degrees north latitude. They are also found farther to the north-east, where some have settled in North Bengal and Western Assam. They are the most easterly of the great belt of primitive folk which stretches across Central India.

Where the Chota Nagpur plateau begins to give way to the Ganges plain the country is broken up into a series of ridges. Through the narrow valleys thus formed flow many streams which maintain a brief and furious life during the rains. There are few big rivers, and even these dry to nothingness in the hot season. In some parts there are ranges of low hills; in others conical-shaped hills rise abruptly from the undulating plain. The countryside is still for the most part well wooded, and the *sal* forests (*Shorea robusta*, Gartn.) contribute to the wellbeing of those who dwell in them. It is, however, a hard country in which to live, where the soil is rocky and the water supplies are scant.

Dr. B. S. Guha[1] has distinguished six main types among the races who inhabit India. The Santals belong to his second "main race", the Proto-Australoid, which he considers arrived in India soon after the Negritos. The name is given because of the similarity of racial type with Australian tribes. "We have no precise information as to when this race first came into India. It is found among the prehistoric skulls in the Tinnevelly district, and from references in early Sanskrit literature to 'Nishads', where they are described as noseless (*anash*) with dark skin colour and peculiar speech and habits, there can be no doubt that the Proto-Australoid tribes were meant."[2] The Santals are short in stature, and among them the broad flat nose with a sunken nose ridge is fairly common. They frequently have wavy hair; sometimes it is curly, though it is never frizzy. They share all these characteristics with other primitive tribes in the same group. Dr. Guha has cautiously attempted to state

[1] B. S. Guha, *Oxford Pamphlets on Indian Affairs*, "Racial Elements in the Population", 1944.
[2] B. S. Guha, *op. cit.*, p. 11.